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Section	B
Department	(SE) e
Semester	2nd
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(Answer No 1)

(part (i))

ID = 18284.

$$A = \begin{bmatrix} 1 & 2 & 6 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$$

$$A_{ij} = (-1)^{i+j} M_{ij}$$

$$Adj\ A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$@\ A_{11} = (-1)^{1+1} M_{11} = \begin{vmatrix} 3 & 1 \\ 1 & 2 \end{vmatrix}$$

$$A_{11} = M_{11} = 6 - 1$$

$$\boxed{A_{11} = 5}$$

$$A_{12} = (-1)^{1+2} M_{12} = \begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix}$$

$$= -M_{12} = -(4-3)$$
$$= -1$$

$$\boxed{A_{12} = -1}$$

$$A_{13} = (-1)^{1+3} M_{13} = \begin{vmatrix} 2 & 3 \\ 3 & 1 \end{vmatrix}$$

$$A_{13} = M_{13} = 2 - 9$$
$$= -7$$

$$\boxed{A_{13} = -7}$$

$$A_{21} = -M_{21} = \begin{vmatrix} 2 & 6 \\ 1 & 2 \end{vmatrix}$$

$$= -(4-6)$$
$$= -(-2)$$

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$$\boxed{A_{21} = 2}$$

$$A_{22} = M_{22} = \begin{vmatrix} 1 & 6 \\ 3 & 2 \end{vmatrix}$$

$$= 2 - 18$$

$$\boxed{A_{22} = -16}$$

$$A_{23} = -M_{23} = \begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix}$$

$$= -(1-6)$$

$$= -(-5)$$

$$\boxed{A_{23} = 5}$$

$$A_{31} = M_{31} = \begin{vmatrix} 2 & 6 \\ 3 & 1 \end{vmatrix}$$

$$= 2 - 18$$

$$\boxed{A_{31} = -16}$$

$$A_{32} = -M_{32} = \begin{vmatrix} 1 & 6 \\ 2 & 1 \end{vmatrix}$$

$$= -(1-12)$$

$$= -(-11)$$

$$\boxed{A_{32} = 11}$$

$$A_{33} = M_{33} = \begin{vmatrix} 1 & 2 \\ 2 & 3 \end{vmatrix}$$

$$= 3-4$$

$$= -1$$

$$\boxed{A_{33} = -1}$$

so

$$\text{Adj } A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

putting values.

$$\text{Adj } A = \begin{bmatrix} 5 & -1 & -7 \\ 2 & -16 & 5 \\ -16 & 11 & -1 \end{bmatrix}$$

(part B)

$$B = \begin{bmatrix} 3 & 4 & 5 \\ 2 & -1 & 8 \\ 5 & -2 & 8 \end{bmatrix}$$

$$\text{Adj } A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$a_{11} = M_{11} = -8-(-16)$

$= -8+16$

$= 8$

$\boxed{a_{11} = 8}$

$a_{12} = -M_{12} = -(18-40)$

$= 24$

$\boxed{a_{12} = 24}$

$a_{13} = M_{13} = -4-(-5)$

$= -4+5$

$= 1$

$\boxed{a_{13} = 1}$

$a_{21} = -M_{21} = -(32+10)$

$= -42$

$\boxed{a_{21} = -42}$

$a_{22} = M_{22} = 24-25$

$= -1$

$\boxed{a_{22} = -1}$

$$a_{23} = -m_{23} = -(-6-20)$$
$$= -(-26)$$
$$= 26$$
$$\boxed{a_{23} = 26}$$

$\cancel{a_{21}}$

$$a_{31} = m_{31} = 32+5$$
$$= 37$$
$$\boxed{a_{31} = 37}$$

$$a_{32} = -m_{32} = -(\cancel{20}\,24-10)$$
$$= -(14)$$
$$= -14$$
$$\boxed{a_{32} = -14}$$

$$a_{33} = m_{33} = -3-8$$
$$= -11$$
$$\boxed{a_{33} = -11}$$

So

$$Adj\ A = \begin{bmatrix} 8 & 24 & 1 \\ -42 & -1 & 26 \\ 37 & -14 & -11 \end{bmatrix}$$

(Answer No 2)

$$A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$$

Now finding A_{21}

$$A_{21} = \begin{vmatrix} -2 & 3 \\ -3 & 2 \end{vmatrix}$$

$$= -4 + 9$$

$$\boxed{A_{21} = 5}$$

Now finding A31

$$A31 = \begin{vmatrix} -2 & 3 \\ 3 & 1 \end{vmatrix}$$

$= -2 - 9$

$\boxed{A31 = -11}$

$$A33 = \begin{vmatrix} 1 & -2 \\ -2 & 3 \end{vmatrix}$$

$= 3 - 4$

$= -1$

$\boxed{A33 = -1}$

{Answer No 3}

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ -1 & 1 & 2 \end{bmatrix}$$

and $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Now for finding eigenvalues we use this theorem.

$$|A - \lambda I| = 0$$

$$\left| \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ -1 & 1 & 2 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \right| = 0$$

$$\left| \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ -1 & 1 & 2 \end{bmatrix} - \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix} \right| = 0$$

$$\Rightarrow \begin{vmatrix} 2-\lambda & 1 & 1 \\ 1 & 3-\lambda & 2 \\ -1 & 1 & 2-\lambda \end{vmatrix} = 0$$

$$(2-\lambda)\left((3-\lambda)(2-\lambda)-2\right)-1\left((2-\lambda)+2\right)$$
$$+1\left(1+(3-\lambda)\right)=0$$

$$\Rightarrow (2-\lambda)(6-3\lambda-2\lambda+\lambda^2-2)-(2-\lambda+2)+1(1+3-\lambda)=0$$

$$\Rightarrow (2-\lambda)(4-5\lambda+\lambda^2)-\cancel{(4-\lambda)}+\cancel{(4-\lambda)}=0$$

$$\Rightarrow (2-\lambda)(4-5\lambda+\lambda^2)=0$$

$2-\lambda=0$

$-\lambda=-2$

$\boxed{\lambda=2}$

$\Rightarrow \lambda^2-5\lambda+4=0$

$\lambda^2-1\lambda-4\lambda+4=0$

$\lambda(\lambda-1)-4(\lambda-1)=0$

$\boxed{\lambda=1}$ $\quad \lambda-4=0$

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$\boxed{\lambda = 4}$

So the

eigen values are
$\boxed{\lambda = 1, 2, 4}$

Now finding eigenvector
for $\boxed{\lambda = 1}$

Let
$X_1 = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ be the

eigenvector of $\boxed{\lambda = 1}$

$(A - \lambda I) X_1 = 0$

$$\begin{bmatrix} 2-1 & 1 & 1 \\ 1 & 3-1 & 2 \\ -1 & 1 & 2-1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = 0$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = 0$$

$R_3 \rightarrow R_3 + R_1$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 0 & 2 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = 0$$

$x + y + z = 0 \quad \text{—(i)}$

$x + 2y + 2z = 0$

$0 + 2y + 2z = 0$

by solving (i)

Let $y = k_1$ and $z = k_2$

$x = -k_1 - k_2$

$$x_1 = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = k_1 \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} + k_2 \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

Hence Eigen vector corresponding $x = 1$

$$X_2 = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}, \quad X_3 = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

Ans.

$\boxed{\text{End}}$